

## INDUSTRIAL STAIRWAY DESIGN

### INTRODUCTION

OSHA 29 CFR 1910.24c states:

Fixed stairways shall be designed and constructed to carry a load of five times the normal live load anticipated but never of less strength than to carry *safely* a moving concentrated load of 1000 pounds.

The interpretation of this section has caused some confusion in the design and evaluation of industrial stairways. In order to provide a direction and lab wide consistency of analysis, a recommended procedure has been developed to be utilized in the design of industrial stairs.

### DEFINITIONS

Industrial Stairway - Fixed interior and exterior stairs around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms, or pits. Does not apply to stairs used solely for fire exit purposes, to private residences, or to articulated stairs, such as may be installed on floating roof tanks or on dock facilities, the angle of which changes with the rise and fall of the base support.

**ASCE 7-98 - An ASCE Standard, "Minimum Design Loads for Buildings and Other Structures," published by the American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, Virginia 20191-4400.**

A Moving Concentrated Load - A load which is placed at various locations on the stairway to produce worst case loading scenarios.

### SPECIAL RESPONSIBILITIES

The division/section head who controls the area in which the industrial stairway is located is responsible for carrying out the requirements of this chapter.

The Mechanical Safety Subcommittee shall serve the division/section heads and ES&H Section in a consulting capacity on all industrial stairway design requirements or policies. The subcommittee may propose appropriate modifications to this chapter as necessary. Changes in policy and responsibility shall be recommended by the Laboratory Safety Committee after consulting with the division/section heads. Changes in procedure shall be recommended by the Mechanical Safety Subcommittee.

## **PROCEDURE**

The design, fabrication, and/or installation of industrial stairways shall follow sound engineering practices. Industrial stairways utilized at Fermilab shall be designed according to the following procedure:

1. For stairways subjected to normal loading, use live loads as shown in Table 2 of **ASCE 7-98**, "MINIMUM DESIGN LOADS for BUILDINGS and OTHER STRUCTURES" or a moving load of 1000 pounds, whichever produces the greatest stress in the member under consideration. Member stresses shall be limited by the allowable values as given in the appropriate code for the material used in the stairway construction.
2. For stairways subjected to loads in excess of the normal loads as outlined in 1. above, a design value of five times the maximum anticipated load shall be used for analysis of the stairway. Member stresses under this loading shall be limited by the ultimate strength of the material used in the stairway construction. The member in consideration must also be checked for a moving load of 1000 pounds with member stresses limited to allowable values as given in the appropriate code for the material used in the stairway construction.